Name: ____ Date: ____________________

Polynomial Operations SOLUTION (version 213)

1. Let polynomials $p(x)$ and $q(x)$ be defined below.

$$p(x) \;=\; -x^5 - 7x^4 - 5x^3 - 2x^2 + 6$$

$$q(x) \;=\; 2x^5 - x^3 - 6x^2 - 10x + 5$$

Express the difference $q(x) - p(x)$ in standard form.

Get "unsimplified" forms. Then find $q(x) - p(x)$ with addition/subtraction.

$$\begin{aligned}
p(x) &= (-1)x^5 + (-7)x^4 + (-5)x^3 + (-2)x^2 + (0)x^1 + (6)x^0 \\
q(x) &= (2)x^5 + (0)x^4 + (-1)x^3 + (-6)x^2 + (-10)x^1 + (5)x^0 \\
q(x) - p(x) &= (3)x^5 + (7)x^4 + (4)x^3 + (-4)x^2 + (-10)x^1 + (-1)x^0 \\
q(x) - p(x) &= 3x^5 + 7x^4 + 4x^3 - 4x^2 - 10x - 1
\end{aligned}$$

2. Let polynomials $a(x)$ and $b(x)$ be defined below.

$$a(x) \;=\; 5x^2 - 9x + 7$$

$$b(x) \;=\; 2x - 3$$

Express the product $a(x) \cdot b(x)$ in standard form.

You can use a table for multiplication.

*	$5x^2$	$-9x$	7
$2x$	$10x^3$	$-18x^2$	$14x$
-3	$-15x^2$	$27x$	-21

$$a(x) \cdot b(x) \;=\; 10x^3 - 18x^2 - 15x^2 + 14x + 27x - 21$$

Combine like terms.

$$a(x) \cdot b(x) \;=\; 10x^3 - 33x^2 + 41x - 21$$

3. Express $(x+1)^5$ in standard (expanded) form.

Remember the binomial theorem. It tells us to use Pascal's triangle.

$$x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$$

Polynomial Operations SOLUTION (version 213)

4. Let polynomials $f(x)$ and $g(x)$ be defined below.

$$\begin{aligned} f(x) &= -x^3 - 9x^2 - 13x + 28 \\ g(x) &= x + 6 \end{aligned}$$

The quotient of $\frac{f(x)}{g(x)}$ can be expressed as a polynomial, $h(x)$, and a remainder, R (a real number).

$$\frac{f(x)}{g(x)} = h(x) + \frac{R}{x+6}$$

By using synthetic division or long division, express $h(x)$ in standard form, and find the remainder R.

I prefer using synthetic division.

	-1	-9	-13	28
-6		6	18	-30
	-1	-3	5	-2

So,

$$\frac{f(x)}{g(x)} = -x^2 - 3x + 5 + \frac{-2}{x+6}$$

In other words, $h(x) = -x^2 - 3x + 5$ and the remainder is $R = -2$.

5. Let polynomial $f(x)$ still be defined as $f(x) = -x^3 - 9x^2 - 13x + 28$. Evaluate $f(-6)$.

You could do this the hard way.

$$\begin{aligned} f(-6) &= (-1)\cdot(-6)^3 \;+\; (-9)\cdot(-6)^2 \;+\; (-13)\cdot(-6) \;+\; (28) \\ &= (-1)\cdot(-216) \;+\; (-9)\cdot(36) \;+\; (-13)\cdot(-6) \;+\; (28) \\ &= (216) \;+\; (-324) \;+\; (78) \;+\; (28) \\ &= -2 \end{aligned}$$

Or, if you reference the polynomial remainder theorem, you can state that you know $f(-6)$ equals the remainder when $f(x)$ is divided by $x+6$. Thus, $f(-6) = -2$.